

KNOWLEDGE EXPECTATIONS FOR PEST CONTROL ADVISERS: DEFOLIATION AND OTHER HARVEST-AID PRACTICES

I. INTRODUCTION

Define:

defoliation;
desiccation.

A. The Purpose of Defoliants and Harvest-Aids

List the reason for using defoliants and harvest-aids (prepares crops for harvest in a timely manner; maintains yield in seed alfalfa; maintains yield and quality in cotton; reduces leaf trash; prepares for uniform harvest; facilitates mechanical harvest; reduces moisture in modular harvested cotton; improves ease of harvest in seed alfalfa)

List the advantages for manipulating harvest timing (harvest during more favorable weather conditions; allows time for preparation for next crop; facilitates efficient use of labor and equipment).

Describe how defoliants and harvest-aids sustain quality.

Describe how harvest-aids help avoid late season pests.

II. PHYSIOLOGICAL PROCESSES INVOLVED IN DEFOLIATION AND DESICCATION

Recognize that defoliation is a natural process.

Describe how the following plant hormones affect vegetative growth, plant aging and loss of leaves:

auxin;
ethylene;
abscissic acid.

Describe the changes in plant hormone levels that occur over time in normal development of a cotton plant and how they affect vegetative, flower and boll growth.

Identify, on a cotton plant, the:

abscission layer;
petiole;
leaf blade;

stem;
vascular tissue.

Recognize where leaf abscission takes place on cotton.

Describe the function of the leaf cuticle.

Describe how plant water stress affects chemical penetration through the leaf cuticle.

Describe how air humidity affects chemical penetration through the leaf cuticle.

Distinguish the difference in the plant response to application of defoliants and desiccants.

List external conditions that affect the rate and degree of natural defoliation (insects; weeds; disease; water stress; high fruit load; excess nitrogen).

Describe the effect of the following factors on ease of defoliation:

- nitrogen status;
- water status;
- plant maturity;
- air temperature;
- weed infestations;
- insect pests—aphid, whitefly, and others;
- plant population density;
- humidity;
- plant vigor/rankness.

Describe how desiccants affect plant cells.

III. COTTON

Describe how a disruption in plant growth during flowering and boll filling affect cotton boll maturity.

Describe the approximate amount of time after flowering it takes a boll to:

- reach final fiber length;
- develop a high viability seed;
- reach fiber maturity.

Identify the approximate range of time or degree days it takes for bolls to develop from squares to mature bolls.

Describe how defoliant efficacy is impacted by cotton being a perennial plant.

Recognize that defoliation induces stress to begin defoliation process but does not kill cotton.

Define:

- module;
- rank growth;
- cutout;
- cracked boll;
- first position cracked boll (FP-1);
- regrowth;
- nodes above crack boll.

A. Types of Harvest-Aids

Recognize that defoliants and other harvest-aids are specialized herbicides.

1. Defoliants

Recognize that the following materials are defoliants:

- cacodylic acid;
- dimethipin;
- endothall;
- paraquat;
- sodium chlorate;
- thidiazuron;
- tribufos;
- thidiazuron & diuron.

List the conditions that favor the use of the following defoliants:

- cacodylic acid;
- dimethipin;
- endothall;
- paraquat;
- sodium chlorate;
- thidiazuron;
- tribufos;
- thidiazuron & diuron.

Describe how the presence of johnsongrass, field bindweed, nutsedge, nightshade, and annual morningglory affect:

- defoliation decisions;
- choice of chemical materials.

Recognize the most appropriate combination of chemical harvest aids for the following situations:

Condition 1: fields with heavy boll load, abrupt cutout, and warm temperature ($>80^{\circ}$ F.) at application.

Condition 2: late plantings, low bottom retention, rank growth in Pima or Acala, or cool temperature ($<80^{\circ}$ F.) at application.

Describe the function of adjuvants when using some harvest aid chemicals.

Recognize that some defoliant labels require adjuvants.

2. Types of Desiccants

Recognize that the following materials can be used as desiccants at certain rates and environmental conditions:

cacodylic acid;
endothall;
paraquat;
sodium chlorate.

Describe how the following factors affect the efficacy of desiccants:

soil residual moisture;
plant-water status;
rate of desiccant application;
air temperature (high or low);
humidity (high vs. low);
plant vigor.

3.Types of Boll Openers

Recognize that ethephon is a boll opener.

Describe a situation in which the application of a boll opener would be advantageous.

Describe conditions in which the application of a boll opener would reduce quality and yield.

4.Preconditioners

Describe the role of preconditioners as a harvest-aid.

Recognize the proper application timing for preconditioners.

Recognize that glyphosate, ethephon, thidiazuron, and thidiazuron-diuron can be used as preconditioners.

Recognize that depending on rate and environmental conditions, some preconditioners also act as desiccants.

List three other benefits in using glyphosate as a preconditioner (enhanced defoliation; weed control; regrowth control).

B. Preparing for Harvest-Aid Applications

Describe how to determine appropriate application timing for:

- defoliant;
- desiccants;
- boll openers;
- preconditioners.

Describe how effectiveness of defoliant, boll openers, and desiccant applications may change later in the season (after October 20th).

Identify how many degree days (or approximate range in number of days) past the last effective flower are needed to time defoliation application to help determine a target harvest date.

Describe how to determine boll maturity and maximum harvestable bolls using the following methods:

- sharp knife technique;
- percent open bolls;
- nodes above cracked boll;
- seed coat color change;
- plant monitoring;
- cutout date to calculate degree days.

Describe how to measure nodes above cracked boll (NACB).

Describe the relationship between defoliation or desiccation application timing based on nodes above cracked boll and yield and quality.

Describe what happens if defoliation or desiccation materials are applied at a higher rate than recommended by the nodes above cracked bolls.

Describe how the differences in response to defoliation affect material choice and timing in the Pima versus Upland variety of cotton.

C. Environmental and Plant Factors Affecting Defoliation

Describe the general effects of the following factors on the ease of cotton defoliation:

- temperature;

humidity;
plant water stress;
soil water availability;
soil and plant nitrogen;
disease;
insects;
weeds;
plant size and vigor;
difficulty in chemical penetration of plant cover;
boll load;
influence of water stress and variety effects on cuticle thickness, waxiness and hairiness on chemical uptake and penetration.

Describe how the relative level of plant vigor affects defoliation.

Describe how to manage vegetative growth.

Describe how vegetative growth is affected by:

poor early or midseason boll retention;
lygus damage;
high nitrogen;
excessive irrigation;
high heat;
high plant density.

Recognize that there is variability among cotton varieties in defoliation ease and success.

Describe how plant maturity (boll load) affects defoliation effectiveness.

D. Application Methods and Considerations for Chemical Use

Describe some environmental, safety, and coverage problems associated with defoliant application by aircraft.

Explain the advantage of a defoliant application using ground equipment when the plant canopy is dense and tall.

Describe the importance of leaf coverage on defoliation effectiveness.

Explain how droplet size impacts defoliation effectiveness.

Describe how site surroundings (buildings, schools, roads, crops, other features) can affect the choice of defoliation or desiccation material and method of application.

Identify plantback restrictions that may apply to defoliant, desiccant, and other harvest-aid materials and list sources on how to obtain specific information.

List two defoliation and desiccation materials with odor problems.

Identify two defoliation materials hazardous to human health.

Describe how the following problems impact the choice of sodium chlorate as a defoliant:

- salt build-up;
- plant back restrictions;
- persistence in soil.

Recognize that excessive applications of cacodylic acid can result in arsenic residues in cotton lint.

Describe a problem associated with the use of magnesium chloride in organically grown cotton.

Describe the defoliation options available for organically grown cotton.

Explain why organically grown cotton typically cannot be stored in modules even when machined harvested.

E. Importance of Regrowth Control

Explain why regrowth can often occur.

Describe how regrowth can reduce quality and successful module storage.

List plant and cultural management factors important in assessing regrowth potential.

Identify how regrowth potential affects harvest-aid chemical selection.

Describe how soil moisture conditions affect amount of regrowth tolerable prior to harvest.

IV. ALFALFA, SMALL-SEEDED LEGUMES AND OTHER PLANTS

A. Types of Desiccants

Recognize that diquat and endothall are desiccants used in seed alfalfa.

B. Preparing for Harvest-Aid Applications

Identify when alfalfa seeds are physiologically mature and ready to be desiccated.

C. Environmental and Plant Factors Affecting Desiccation

Describe the impact of soil moisture on crop maturity and effectiveness of desiccation.

List the factors that determine desiccation timing in alfalfa.

(seed maturity; when 97% of seeds have reached physiological maturity—occurs 30 days after pollination)

Describe how the following factors affect alfalfa seed maturity and choice of desiccant:

soil type;
water table;
salt;
crop load and seed set;
mites.

Describe the relationship between plant size and vigor to the amount and number of applications of desiccant required.

Describe the impact of rain on alfalfa seed after desiccation.

C. Application Methods and Considerations for Chemical Use

Describe a situation in which the application of a desiccant by ground would improve coverage.

Describe the importance of thorough leaf coverage when using a desiccant on alfalfa.

Describe the advantages and disadvantages of cutting in windrow (windrow-curing) to dry alfalfa instead of desiccating seed alfalfa.

Explain why desiccants might be applied at night on seed alfalfa.

D. Crop Management

Describe the importance of late season irrigation management on efficiency of desiccation on seed alfalfa.

V. OTHER CROPS

List crops other than cotton and alfalfa which occasionally use desiccants in California.